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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/578,265	07/03/2006	Shahab Jahromi	4662-182	1954
23117 7590 10/29/2008 NIXON & VANDERHYE, PC 901 NORTH GLEBE ROAD, 11TH FLOOR ARLINGTON, VA 22203				
EXAMINER				
RAYMOND, BRITTANY L				
ART UNIT		PAPER NUMBER		
1795				
MAIL DATE		DELIVERY MODE		
10/29/2008		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/578,265

Applicant(s)

JAHROMI ET AL.

Examiner

BRITTANY RAYMOND

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 July 2008.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-8,11-13,16 and 18-48 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1,3-8,11-13,16 and 18-48 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 04 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 7/7/2008.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
2. Claims 1, 3-8, 13, 16, 43 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garito (U.S. Patent Publication 2003/0175004) in view of Taketo (JP Publication 10-340846).

Garito discloses optical polymer nanocomposites comprising inorganic nanoparticles in a matrix. Garito states that the inorganic nanoparticles have index of refraction values between about 1 and 4 and that they can be used to make the index of refraction of the nanocomposites from about 1 to 5 (Paragraphs 0104 and 0105), as recited in claims 1, 5, 6, 43 and 46 of the present invention. Since the range of values of the index of refraction is so large, it would be obvious that the index of refraction can be changed by at least 1% using the nanoparticles, and that the nanoparticles could be

added to an amount that the nanocomposite has the same refractive index as the nanoparticles, as recited in claims 1, 13 and 43 of the present invention. Garito also discloses that nanoparticles have a size from about 10 nm to about 500 nm, and can be as small as 1 nm (Paragraph 0004), as recited in claims 7 and 8 of the present invention.

Garito fails to disclose that the nanoparticles are added to an immersion fluid for an immersion lithography process, that the exposure is performed using light at a wavelength of 193 nm, and that the immersion fluid is recycled through the system and cleaned.

Taketo discloses an immersion lithography process and exposure apparatus comprising: a refractive index adjusting device that increases the amount of an additive that is provided in the immersion liquid in order to increase the refractive index to that of the additive, and a recycling system that is used to recycle the immersion liquid used in the exposure process (Paragraphs 0026-0032), as recited in claims 1, 3, 13, 16 and 43 of the present invention. Since the amount of additive is being monitored, it would be apparent that the amount of additive present can either be very small or large, as recited in claim 4 of the present invention. Taketo also discloses that a 193 nm exposing light can be used (Paragraph 0020), as recited in claims 1 and 43 of the present invention.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have placed the nanoparticles of Garito in an immersion fluid, as suggested by Taketo, because Taketo teaches that an immersion fluid with an

increased index of refraction allows for a more accurate photoresist pattern to be formed. It also would have been obvious to one of ordinary skill in the art to have recycled and then cleaned the immersion fluid during exposure, as suggested by Taketo, because Taketo teaches that this process efficiently produces an immersion fluid with a desired index of refraction.

3. Claims 18-24, 27-39, 42, 44, 45, 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garito (U.S. Patent Publication 2003/0175004) in view of Taketo (JP Publication 10-340846) as applied to claims 1, 3-8, 13, 43 and 46 above, and further in view of Vogel (U.S. Patent Publication 2004/0257544).

The teachings of Garito and Taketo have been discussed in paragraph 2 above. Garito and Taketo teach every limitation of claims 22-24, 27-29, 31, 33-39 and 42 of the present invention.

Garito and Taketo fail to disclose that the immersion fluid is an alkane, and that the alkane comprises 6 to 10 carbon atoms.

Vogel discloses that the immersion fluid for a 193 nm imaging is preferably water, or can be a cyclo-octane (Paragraph 0048), as recited in claims 18-21, 30, 32, 44, 45, 47 and 48 of the present invention.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have used alkane as the immersion fluid of Garito and Taketo, as suggested by Vogel, because Vogel teaches that cyclo-octane is a common immersion fluid for producing accurate photoresist patterns in 193 nm exposures.

4. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garito (U.S. Patent Publication 2003/0175004) in view of Taketo (JP Publication 10-340846) as applied to claims 1, 3-8, 13, 43 and 46 above, and further in view of Pohl (U.S. Patent 5618872).

The teachings of Garito and Taketo have been discussed in paragraph 2 above.

Garito and Taketo fail to disclose that the nanoparticles comprise an Al 3+ compound, or fused amorphous SiO₂, MgO, nanodiamond, and/or MgAl₂O₄.

Pohl discloses inorganic fillers for changing refractive index values of organic matrix materials. Pohl states that the inorganic fillers can comprise SiO₂ or Al₂O₃ (Column 2, Lines 30-36), as recited in claims 11 and 12 of the present invention.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have used the nanoparticles of Pohl in the process of Garito and Taketo because Pohl teaches that these compounds have high refractive index values and can increase the refractive index of a surrounding matrix.

5. Claims 25, 26, 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garito (U.S. Patent Publication 2003/0175004) in view of Taketo (JP Publication 10-340846) and Vogel (U.S. Patent Publication 2004/0257544) as applied to claims 18-24, 27-39, 42, 44, 45, 47 and 48 above, and further in view of Pohl (U.S. Patent 5618872).

The teachings of Garito, Taketo and Vogel have been discussed in paragraphs 2 and 3 above.

Garito, Taketo and Vogel fail to disclose that the nanoparticles comprise an Al 3+ compound, or fused amorphous SiO₂, MgO, nanodiamond, and/or MgAl₂O₄.

Pohl discloses inorganic fillers for changing refractive index values of organic matrix materials. Pohl states that the inorganic fillers can comprise SiO₂ or Al₂O₃ (Column 2, Lines 30-36), as recited in claims 25, 26, 40 and 41 of the present invention.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have used the nanoparticles of Pohl in the process of Garito and Taketo because Pohl teaches that these compounds have high refractive index values and can increase the refractive index of a surrounding matrix.

Response to Arguments

6. Applicant's amendments have overcome the rejection of claims 6-8, 11 and 12 under 35 USC 112 2nd paragraph that were presented in the last Office Action. Examiner has withdrawn the rejections.

7. Applicant's arguments, filed 7/7/2008, have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art references.

The reference, Garito, has been added to teach that inorganic nanoparticles can be added to a matrix to increase the index of refraction of the matrix. Garito discloses a large range of possible refractive index values that can be produced using the nanoparticles, which shows that depending on the type and amount of nanoparticle used, the index of refraction can be increased by a large percentage.

The reference, Taketo, remains in the rejection to teach the importance of a high index of refraction for immersion fluids. Taketo also teaches that the additive can also be soluble in the immersion fluid, unlike the nanoparticles. Applicant argues that Taketo does not teach the recycling of the immersion fluid during exposure. However, it is apparent from Figure 2 that the immersion fluid is taken from above the substrate and is recycled back through the introducing pipe and over the substrate again.

The reference, Vogel, has been added to teach that cyclo-octane, an alkane, is a common immersion fluid for 193 nm exposures.

The reference, Pohl, has been added to teach that Al_2O_3 and SiO_2 are common nanoparticles used to increase the index of refraction of an organic matrix.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRITTANY RAYMOND whose telephone number is (571)272-6545. The examiner can normally be reached on Monday through Friday, 8:30 a.m. - 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark F. Huff/
Supervisory Patent Examiner, Art Unit 1795

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